IX. CONCLUSIONS AND RECOMMENDATIONS

The Cultural Resources Division of Parsons Engineering Science, Inc., was contracted to conduct Phase I archaeological survey of two proposed stormwater management areas and Phase II evaluative testing of the Iron Hill East site (7NC-D-108). All three locations occur along SR 896 in New Castle County. The goal of archaeological survey in the two proposed stormwater management locales was to identify the presence or absence of archaeological resources within the project areas. The goal of Phase II testing at Iron Hill East was to determine the potential significance of the site for listing on the National Register of Historic Places. The following discussion summarizes the results of the survey and testing programs and provides recommendations for future treatment of the project areas.

A. Stormwater Management Area 1

Stormwater Management Area 1 was located east of SR 896 and 150 feet north of the current intersection of SR 896 and the Four Seasons Parkway. The project area measured 33,600 square feet. No artifacts were recovered as a result of shovel testing in this survey area. There was no indication of cultural activity other than historic plowing, as indicated by an inactive plow zone, and domestic activity associated with recent standing structures. No historic properties were encountered on the site, and thus no further archaeological work is recommended in this area.

B. Stormwater Management Area 2

Stormwater Management Area 2 was located 120 feet east of the current SR 896 right-of-way at the intersection of SR 896 and County Road 408 (Old Cooch's Bridge Road). The survey area measured 18,000 square feet. No artifacts were recovered as a result of subsurface testing. There was no indication of cultural activity in this survey area other than historic period plowing, as indicated by an inactive plow zone. No historic

properties were encountered, and thus no further archaeological work is recommended in this area.

C. Iron Hill East (7NC-D-108)

The Iron Hill East site was located on the eastern slope of Iron Hill, lying along SR 896, south of I-95. Phase II evaluative testing consisted of systematic shovel testing of the entire site area within the proposed SR 896 corridor east of the current right-of-way. In addition, a series of $1m^2$ test units was excavated to examine stratigraphy in detail. The site was found to consist of a scatter of historic period and prehistoric artifacts. The two components, historic period and prehistoric, are treated separately in the following discussion.

1. Historic Period Component

In total, 71 historic period artifacts were recovered from the proposed SR 896 right-of-way during the current testing program. Background research indicated that the proposed corridor was situated in a zone of historic period activity. Consideration was thus given to whether the artifacts recovered from the site were archaeologically significant in and of themselves under National Register Criteria, or were potentially contributing elements of the nearby Cooch's Bridge Historic District, located east of SR 896 along the Christina River. The National Register district consists in the main of eighteenth and nineteenth century structures, including domestic residences and rural industrial sites, such as mills. In addition, the District includes the purported scene of the Revolutionary War military action known as the Battle of Cooch's Bridge, which took place on September 3, 1777. The potential for cultural resources related to the battle within the proposed highway corridor was considered low, based on earlier study conducted during the initial survey of the SR 896 right-of-way (Lothrop et al. 1987). Archival research further indicated that there were no historic structures recorded in the immediate vicinity of the right-of-way.

The artifacts recovered during Phase II testing at the site consisted of architectural debris, such as nails, window glass, roofing slate, and linoleum tile; industrial materials (probably farm-related), such as barbed wire and fragments of miscellaneous hardware; domestic debris in the form of ceramic fragments, such as pearlware, whiteware, and ironstone, along with bottle or vessel glass; and one spherical, lead musket ball. These artifacts represented a range of dates from the mid-nineteenth to the mid-twentieth centuries. The lack of high artifact counts or observable clustering of material suggests that the materials were not related to unmapped structures, but rather represent debris associated with the margins of SR 896, a heavily traveled road. The materials are also typical in character, frequency, and spatial distribution of the type of historical debris recovered from agricultural fields that have seen repeated and long-term plowing (Delaware State Historic Preservation Office 1993:45). The materials cannot be shown to be directly associated with the Cooch's Bridge Historic District. The single lead musket ball was of a type used in military weapons until the late 1850s, but there was no direct evidence that the artifact was related to Revolutionary War engagements that occurred in the area.

In sum, the historic period artifacts from Iron Hill East are not considered to be potentially significant under National Register Criteria, nor do they relate to the National Register District located east of the project area. With regard to the historic period component of the Iron Hill East site, a finding of no historic properties was made. No further archaeological work is therefore recommended on the historic period component of the site.

2. Prehistoric Component

In total, 825 prehistoric artifacts were recovered from Iron Hill East during Phase II evaluative testing. The objective of the following discussion is to evaluate the findings in relation to prehistoric chronology, settlement, and technology.

Chronology

A single projectile point was recovered as a result of the Phase II testing program. The specimen consisted of the medial section of a relatively broad-bladed point manufactured of red jasper. The point was fragmentary and could not be confidently typed as to morphological or stylistic form. Thus temporal assignment was not possible, and no dates could be associated with site occupation. Temporal data from nearby sites indicate that extraction and utilization of Newark jasper from the Delaware Chalcedony Complex has occurred throughout the 14,000 year span of known human occupation of the region, from the Paleo-Indian to the Woodland II (Custer et al. 1986a; Vidal 1988). No data useful in refining the periods of use of the outcrops were recovered from the Iron Hill East site.

Settlement

Intrasite

Computer-assisted spatial analysis was conducted using data from subsurface testing at Iron Hill East to determine whether culturally significant artifact distribution patterns were preserved within the proposed right-of-way. The results of the analysis did not identify areas of primary cultural activity. The horizontal distribution of prehistoric artifacts within the right-of-way showed a spread of lithic debris throughout most of the western portion of the study area, with the highest concentrations occurring on the terraces above the stream crossing the southern portion of the corridor. Two other areas of clustering occurred, one at each end of the study area. One of these clusters lay at the southern end of the study area, and the second near the northern margin of the site. Although these concentrations potentially implied primary cultural patterns, the material making up the clusters was sufficiently similar to the material found throughout the site which suggests little overall variation, and thus little potential for defining discrete activity areas.

Several alternative distribution plots were constructed using different artifact sub-groups, including debitage bearing classic flake attributes, and debris exhibiting signs of

heat treatment. No patterns were apparent among the sub-groups. Mass analysis, or size-grading, of lithic debris from various proveniences across the site supported the conclusion that there was little differentiation in attributes which could imply the presence of activity areas. In only one portion of the site, identified in Test Unit 6, did the distribution of size-graded debris differ from that of other proveniences. Comparative data from experimental studies suggest that the distribution in Unit 6 resembles the size distribution of debris resulting from the early stages of biface reduction. The sample of debris from Unit 6 was relatively small, and there was little other debris recovered from shovel tests surrounding the unit, implying that the potential for recovering additional data was low.

Two alternatives are suggested for the lack of distinct spatial patterning observed within the Iron Hill East site: 1) the material is in secondary deposition, moved downhill from quarried outcrops by stream flow or soil movement (e.g., mass wasting or soil creep); or 2) repeated plowing throughout the historic period has masked original patterns. Regardless of the ultimate conclusion, the integrity of the Iron Hill East site does not compare favorably with that of other sites identified in association with the Delaware Chalcedony Complex. Many of those sites are in primary context and are unplowed, preserving a relative degree of the original variability in the distribution of tools and debitage.

Intersite

Iron Hill East is considered representative of the aboriginal quarrying of cryptocrystalline lithic raw material for use in stone tool manufacture. Iron Hill East may be viewed as part of a complex of sites consisting of jasper quarries and quarry-related sites associated with the Delaware Chalcedony Complex, stretching from northern Delaware to northeastern Maryland and southeastern Pennsylvania. The cryptocrystalline outcrops on Iron Hill made it an important resource that was exploited in all prehistoric time periods, with special significance during the Paleo-Indian period (Custer 1986; Custer et al. 1986a). Several sites near Iron Hill associated with the Delaware Chalcedony Complex have been investigated, including the Iron Hill Cut Quarry Site (18CE65), Site 7NC-D-3, Site 7NC-D-

19, the Everett site (7NC-D-21), the Iron Hill School Quarry Site (7NC-D-34), and a group of sites referred to as the Cooch Complex sites, which includes Iron Hill East. Although little systematic archaeological work has been conducted at these sites, several have been reported with evidence of occupation ranging from the Paleo-Indian to the Woodland II periods, and many of the sites bear evidence for repeated occupation. The relative uniformity of lithic debris from Iron Hill East suggests a limited range of activity, contrasting the site with other sites associated with the Delaware Chalcedony Complex. Yet the lack of temporal data from Iron Hill East limits the degree to which inference can be drawn for intersite or regional settlement.

Technology

One of the most conspicuous aspects of the artifactual data from Iron Hill East was the amount of uniformity displayed in terms of artifact types and attributes. The lithic material was of the same overall character, consisting primarily of coarse, granular jasper or limonite, the latter comprising the material in which the higher-quality cryptocrystalline jasper occurs. Only a small percentage of the artifacts, mostly the cryptocrystalline jasper, displayed classic flake attributes, yet the majority of the coarse material did bear evidence that could be interpreted as resulting from percussion flaking. While it was admittedly difficult in some individual cases to determine if the material was artifactual or natural, the sample was sufficiently large that occasional misidentifications would not substantially alter statistical analysis. Among the attributes that showed intentional flaking were relative proportions, sharp edges, and the presence of striking platforms. The problem of artifact identification was not unique to Iron Hill East, but is commonly encountered at prehistoric quarry sites, and one which has in large part led to the lack of even descriptive analysis of quarry debris (Purdy 1984).

Because of the problem of artifact identification, it is not surprising that comparative data related specifically to the lithic debris resulting from quarrying are rare in the archaeological literature. In the current study, experimental data resulting from investigations at the Knife River quarry site in North Dakota, as well as from

investigations at sites in northern Virginia bearing secondary quartz deposits, were used for comparative analysis. Analysis of the size distribution of size-graded debitage provided the basis for the conclusion that little or no biface reduction was undertaken at Iron Hill East. No data were available on the waste material from the actual quarrying process at Knife River, only from the workshop areas associated with the quarry. The material at Iron Hill East appears to consist almost entirely of the former. The comparative size-grade data support this contention, since the debris from Iron Hill East is substantially larger than that reported in the Knife River or Virginia databases, in terms of cumulative frequency by weight, as well as in thickness or blockiness, the latter indicated by the analysis of mean weights within size intervals.

Size-grade analysis also suggested that little or no biface reduction was conducted at the site. In addition, few tools were found in association with the lithic debris. These patterns clearly contrast with many of the sites identified in association with the Delaware Chalcedony Complex, particularly the actual quarry sites, such as the Iron Hill Cut Quarry (18CE65) and the Iron Hill School Quarry (7NC-D-34). These sites are composed of large amounts of classic flaking debris and tools produced from high quality cryptocrystalline jasper. In this regard, the Iron Hill East materials may be considered a distinct type of assemblage encountered in the vicinity of primary outcrop quarries.

Site Summary

Phase II investigations at Iron Hill East (7NC-D-108) succeeded in fulfilling their stated goals. Site boundaries were delineated. The north boundary of the site was established by physiography, as the ground sloped downward toward a small stream system, and by a coincident fall-off in artifact density seen in shovel tests. The east boundary was determined by fall-off in artifact density in shovel tests within the agricultural field. The south boundary consisted of the southern edge of the study area, which coincided with extensive, twentieth century disturbance associated with a former domestic structure. To the west, the site extended beyond the disturbance associated with the existing SR 896 right-of-way, which was investigated during Phase I survey (Lothrop et al. 1987).

Based on the information recovered from the Phase II evaluative investigation at Iron Hill East, the site is not considered to be potential eligible for the National Register of Historic Places. The basis of this determination involves the integrity of the artifactual material at the site. A large volume of lithic debris was retrieved from subsurface testing. The lithic material consisted mainly of coarse, granular jasper and limonite, in contrast to the high-quality, cryptocrystalline material found in outcrops located on Iron Hill. Yet distinguishing between artifacts and non-artifactual debris—that is, between quarry debitage and naturally spalled stone—was not entirely conclusive. The site lay 600-800m downslope from known outcrops of high-quality material, which suggests that the debris was less likely to have been in primary context than if outcrops lay nearby. No outcrops were observed within the study area. The material lay almost exclusively within an active agricultural field and appeared to lack vertical context, chronological controls, or horizontal integrity.

The absence of meaningful spatial patterning across the field limits the research value of the site. Furthermore, in the absence of chronological controls, the significance of the materials recovered could not be adequately evaluated. It is thus held that there are no historic properties at Iron Hill East (7NC-D-108). No further work is recommended in this location.

D. Final Conclusions

1. Adequacy of the Research Design

The research designs formulated for both Phase I and Phase II investigations are considered to have adequately met the goals of the investigations. In terms of Phase I survey, the general predictive models used for investigation of the stormwater management areas were based on physiographic features, and indicated medium-to-high potential for prehistoric sites in those study areas. More specific models developed for Delaware's Mid-Peninsular Drainage Divide Management Unit suggest low potential for

large, base camps but somewhat greater potential for small, micro-band base camps or procurement or hunting sites. Systematic, subsurface survey methods were used to investigate both study areas. There was no indication of cultural resources in either area, as suggested by the low and medium probability models.

Research at the Iron Hill East site was aimed at determining site boundaries, assessing integrity, and determining the overall research value, and thus significance, of the site. Systematic, subsurface survey, as well as test unit excavation in selected portions of the site, achieved these goals. In two directions, site boundaries as they existed in prehistory were determined, while in the remaining two directions, artificial boundaries described by modern disturbances were documented. Both vertical and horizontal contexts had been compromised by modern agricultural disturbance.

The ability of the data from the Iron Hill East site to address more detailed research issues was mixed. Site chronology could not be directly addressed due to the nature of the data available, although testing did determine that the potential for data from the site that would be appropriate for absolute dating was low. The artifact sample recovered from the site appeared to have been representative. While a larger sample might have produced additional diagnostic artifacts, sampling implied that the potential for diagnostic artifacts was low. Moreover, the lack of vertical or horizontal contextual integrity at the site would render temporal information difficult to interpret in terms of the extent of site use during any specific period.

In the absence of a chronological framework for the occupations at Iron Hill East, research questions focusing on settlement were only addressed in a general manner, in observing the amount of quarrying activity implied by the debris recovered and differences between types of reduction activity implied by lithic debris at the Iron Hill East site and other quarry areas on Iron Hill itself.

Questions pertaining to lithic technology were also addressed by data from the site. The lack of comparative databases was indicated by the comparative analysis conducted herein. As Ericson (1984) and (Purdy 1984) have pointed out, quarry debris is difficult to handle analytically. There is typically a very large volume of debris that must be analyzed. Much of the material is amorphous, and most of it is difficult to distinguish from naturally produced spalls resulting from the weathering of exposed outcrops. The current investigation suggested that methods such as mass analysis may prove to be a practical means of approaching such large quantities of material. Actualistic or experimental studies are also critical to interpreting the results achieved.

Table 9-1. Summary of Recommendations

Property	*Property Type*	*Integrity*	*Recommendation*
Stormwater Management Area 1	modern residential	horizontal: low vertical: low	no further work
Stormwater Management Area 2	open field	horizontal: low vertical: low	no further work
Iron Hill East 7NC-D-108	historic and prehistoric site	horizontal: low vertical: low	no further work

2. Summary of Recommendations

Table 9-1 summarizes the results of Phase I and Phase II investigations conducted during the present study. In all three instances, a finding of no historic properties was made, and no further work was recommended. Phase I survey at the two stormwater management areas determined that depositional contexts at both properties were disturbed. No artifacts were recovered from either location. Phase II testing at Iron Hill East determined that depostional contexts were also disturbed. While a large sample of artifacts was recovered from the site, the lack of temporal diagnostics meant that cultural affiliation could not be assessed. Therefore there was no proper context within which to evaluate the significance of the site. In the final analysis, a determination of no historic properties was made, and no further work was recommended.

In conclusion, archaeological investigations at three locations SR 896 were successfully completed. Survey and testing indicated that no historic properties were present in the portions of the proposed right-of-way extension studied. Hence no further work is recommended. For the reasons enumerated in the preceding text, it is held that the goals of the archaeological survey and testing program have been satisfactorily achieved.